SPRING 2021 NCMN SEMINAR SERIES

XINWEI WANG

MARCH 10 @ 4 P.M.

IOWA STATE UNIVERSITY

Conjugated Phonon and Hot Carrier Behavior in 2D Atomic Layer Materials

ABSTRACT

This talk will cover our new frontier research on phonon and hot carrier transport probing based on Raman scattering, a technology traditionally widely used for structure analysis. We have developed a new technique, termed energy transport-state resolved Raman (ET-Raman). It is capable of probing physical transport processes down to nanosecond and picosecond scales, and is able to simultaneously characterize the conjugated phonon transport in the in-plane and cross-plane directions and hot carriers diffusion in the in-plane direction. 2D materials down to monolayer thickness have been investigated for studying the structure effect on the in-plane thermal conductivity, interface thermal resistance, hot carrier diffusion coefficient/ mobility, and electron-hole radiative recombination. This provides an advanced phonon and electron transport study of virgin 2D materials. Also for the first time, we have distinguished the temperatures of optical and acoustic phonons in 2D materials under photon excitation and characterized the energy coupling factor between them. Solving this decade-long problem presents a significant advance in measuring the intrinsic thermal conductivity and interface thermal conductance of 2D materials and will enable advanced material structure design toward thermal control and optimization.

BIO

Dr. Xinwei Wang is a full professor at Iowa State University. He obtained his Ph.D. from the School of Mechanical Engineering, Purdue University in 2001, and had his M.S. (1996) and B.S. (1994) from the University of Science and Technology of China. Over the past 19 years, he has led his laboratory to develop novel technologies for micro/nanoscale thermal characterization, study ultrafast-laser material interaction, investigate light-structure coupling, and probe energy transport in various materials down the sub-nm scale. His current work focuses on energy transport in 2D atomic layer materials and atomic scale interface phonon energy transport. He has published more than 160 papers in highly-visible journals. He received the inaugural Viskanta Fellow Award of Purdue University in recognition of his pioneering and independent work in thermal sciences. He is the recipient of the 2014 Mid-career Award for Research of Iowa State University (ISU) and 2018 ISU Award for Outstanding Achievement in Research. He is the Fellow of American Society of Mechanical Engineers (ASME) and Associate Fellow of American Institute of Aeronautics and Astronautics (AIAA). He serves as the Senior Editor of International Journal of Thermophysics and Journal of Laser Applications, and associate editor of Heat Transfer Research.

Host: Yongfeng Lu
Electrical & Computer Engineering

Zoom Meeting ID: 960 9422 7440
Meeting link: https://unl.zoom.us/j/96094227440